Phytologia (December 1994) 77(6):425-430.

CORNUS ANGUSTATA (CHUN) T.R. DUDLEY COMB. NOV. AS DISTINCT FROM *C. KOUSA* AND *C. CAPITATA*

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ABSTRACT

The evergreen taxon currently being distributed by American nurseries as "*Cornus kousa* var. *angustata*" is considered to be biologically and biochemically distinct from both *C. kousa* F. Buerger *ex* Hance and *C. capitata* Wall. *ex* Roxb. Although this taxon has been considered as a subspecies of *C. capitata* and has also been elevated to specific rank as *Dendrobenthamia angustata* (Chun) Fang, it is proposed, partly on the basis of new biochemical evidence, that the taxon be recognized in the genus *Cornus* as **C. angustata** (Chun) T.R. Dudley, *comb. nov.*

KEY WORDS: *Cornus*, Cornaceae, *Dendrobenthamia*, Electrophoresis, Peroxidase Isozymes

The purposes of this paper are to (1) discuss the introduction and recent history of the taxon known as "*Cornus kousa* var. *angustata*" in the American nursery trade, (2) examine its nomenclatural background, and (3) provide evidence for its recognition as a distinct species.

Beginning in 1992, a number of American nurseries have been offering plants of an "evergreen flowering dogwood" or "evergreen Japanese dogwood" as a new and rare addition to our gardens. Most nurseries have identified this plant as *Cornus kousa* F. Buerger *ex* Hance var. *angustata* Chun, although some have used the varietal epithets "*angustifolia*" or "*augustata*." As far as we know, the first introduction of this taxon into the United States was made in 1980 by the senior author who, as a member of the first Sino-American Botanical Expedition (SABE) collected seed (*SABE 2032, NA 49163*) from plants in the *Metasequoia* valley of southwest Hubei Province in China (Bartholomew *et al.* 1983; Dudley 1983). Although Raulston (1990) briefly mentioned *C. kousa* var. *angustata* and provided an illustration of a flowering branch of a plant at

the U.S. National Arboretum in Washington, DC, no seed or scions from the Hubei introduction had yet been distributed.

How, then, could nurseries in the United States have obtained sufficient quantities of plants to offer them for sale in 1992 when most nurserymen were not even aware of the existence of such a plant until November 1990? The fact is that a great demand for seed of *Cornus kousa* had arisen because of its supposed resistance to the new and devastating dogwood anthracnose disease that was causing severe damage to plants of *C. florida* L. in native stands and landscape plantings in the northeastern portion of the range of this species. *Cornus florida* belongs to subgenus *Cynoxylon* Raf., a different subgenus from the Asian species under discussion. The resistance of *C. kousa* to anthracnose was proved in 1989 (Santamour *et al.* 1989; Holmes & Hibben 1989) and the causal fungus described as *Discula destructiva* Redlin (1991). Still, this early demand for seed prompted at least one major American dealer to contract for large-scale collections of *C. kousa* seed from China. Purchasers and growers of this seed were surprised to see that some (many, in some cases) of the seedlings they were producing were "evergreen" and otherwise atypical of the common *C. kousa*. The paper by Raulston (1990) allowed nurseries to put a botanical name on these new and unusual plants.

Cornus kousa var. *angustata* Chun was first described by Chun (1934). Hara (1948) placed this taxon in the synonymy of *Benthamidia japonica* (Sieb. & Zucc.) Hara var. *angustata* (Chun) Hara. Fang (1953), noting its evergreen nature, considered this taxon as distinct, placing it in the genus *Dendrobenthamia* (Hutchinson 1942) as *D. angustata* (Chun) Fang "from a lumping of *Cornus kousa* var. *angustata* Chun, *Dendrobenthamia capitata* var. *angustata* Fang, and *Cynoxylon elliptica* Pojarkova." Fang (1953) also recognized *D. angustata* var. *mollis* (Rehd.) Fang. With regard to *C. kousa* itself, Fang (1953) placed it in the synonymy of *D. japonica* (A.P. DC.) Fang, although the correct citation for this species in *Dendrobenthamia* is *D. japonica* (Sieb. & Zucc.) Hutchinson. Hu & Soong (1981) basically repeated the classification of Fang (1953).

Xiang (1987) recognized *Cornus kousa* var. *angustata* as a subspecies of *C. capitata* Wall. (*C. capitata* subsp. *angustata* [Chun] Q.Y. Xiang). She also made the combination *C. capitata* subsp. *angustata* (Chun) Q.Y. Xiang var. *mollis* (Rehd.) Q.Y. Xiang. Xiang (1987) also recognized *C. kousa*, with subsp. *kousa* and subsp. *chinensis* (Osborn) Q.Y. Xiang. A major contribution by Xiang (1987) was the determination, by rule of priority, that all of the large-bracted syncarpous flowering dogwoods mentioned above should be classified in the subgenus *Syncarpea* (Nakai) Q.Y. Xiang rather than in subgenus *Benthamia* (C.B. Clarke) Schneid.

The most recent treatment of Chinese *Cornus* and the segregate genera is found in Flora Reipublicae Popularis Sinicae (Hu 1990). This work listed *Dendrobenthamia angustata* var. *wuyishanensis* (Fang & Hsieh) Fang & W.K.

Hu as another variety of *D. angustata*. *Cornus kousa* was again considered in the synonymy of *D. japonica*, with the typical variety as well as var. *chinensis* (Osborn) Fang, var. *leucotricha* Fang & Hsieh, and var. *huaziensis* Fang & W.K. Hu also being noted.

The purpose of the preceding chronology is to place our current studies in the proper context. The only taxon we are concerned with here is that known as *Cornus kousa* var. *angustata*, *Dendrobenthamia angustata* var. *angustata*, or *C. capitata* subsp. *angustata*. It is beyond the scope of this article to make judgments on any other subspecies or variety of *C. capitata*, *C. kousa*, *D. angustata*, *D. capitata*, or *D. japonica*.

Although the biological (morphological) distinctiveness of *Cornus kousa* var. *angustata* had been recognized by previous authors in elevating this taxon to subspecific or specific rank, the junior author has developed new and significant biochemical evidence to help to justify its specific status. For more than a decade, he has conducted numerous studies on the variation in cambial peroxidase isozymes of trees as they may relate to graft compatibility. Peroxidases mediate the polymerization of cinnamic alcohols into lignin and, as such, have a major role in the growth and development of woody plants. Genus-wide gel electrophoretic surveys of the cambia in 64 taxa of *Acer* (Santamour 1982) and more than 90 taxa of *Quercus* (Santamour 1983) revealed a general relationship between anodal peroxidase banding patterns and sectional classification in *Acer* and subgeneric classification in *Quercus*. Generally, however, such analyses could not be used to identify species, and there frequently was as much variation within species as between species in the same infrageneric category.

Our studies of cambial isoperoxidases in *Cornus* were originally undertaken in an effort to explain some real or imagined problems from grafting of *Cornus kousa* or cultivars of hybrids between *C. kousa* and *C. florida* on rootstocks of *C. florida*. Unlike most of the other woody plants we have examined, species of *Cornus* classified in subgen. *Cynoxylon* or subgen. *Syncarpea* have generally failed to produce any well-defined and consistent anodal peroxidase bands. However, the cathodal bands, those that moved toward the negative pole, were strong and distinctive for taxa in each subgenus. When the anodal front had moved between 55 mm and 60 mm from the origin, we found only a single strong peroxidase band located ca. 37 mm below the origin in *C. florida*. This *C. florida* material included 75 seedlings of known geographic origin (two to four plants each of 20 provenance collections from throughout the species' range), eight cultivars, and a single plant (*NA 57778*) of *C. florida* subsp. *urbiniana* (Rose) Rickett. Cambia from plants of *C. kousa* gave only a single strong peroxidase band ca. 35 mm below the origin, and these included thirteen seedling plants of nursery origin, three cultivars, and eight plants grown from wild-collected seed in China, Japan, and Korea. Such a small difference in the relative mobility of these bands might appear trivial, but the difference

was consistent. In fact, the inadvertent inclusion of a specimen of *C. florida* during the analyses of a number of *C. kousa* plants was obvious on the gel and the mistake was easily verified by examination of the plant from which the sample had been collected. Three plants of *C. nuttallii* Aud. *ex* Torr. & A. Gray from native stands in Washington State gave only the band found in *C. florida*. Five plants of *C. capitata*, one from Bhutan and four of unknown provenance, produced only the band found in *C. kousa*. Thus, the major cathodal isoperoxidase bands in the four taxa mentioned above are consistent with the placement of these species in two different subgenera.

On the other hand, eight specimens from our Hubei-collected *Cornus kousa* var. *angustata* (*NA 49163*) showed a single cathodal peroxidase band at ca. 28 mm below the origin. Analyses of two seedlings resulting from open-pollination of our trees and eight evergreen seedlings grown from commercial seed (and being sold as *C. kousa* var. *angustata*) also gave only the same band. These data suggest that not only is the taxon currently grown and marketed as *C. kousa* var. *angustata* not conspecific with either *C. kousa* or *C. capitata* but also that there is a possibility that *C. kousa* var. *angustata* should be classified in a new and different subgenus. However, we do not want to propose such a drastic step at this point, but a combined morphological-biochemical study of this taxon and some of the other evergreen taxa recently recognized in China might prove interesting. Further evidence of a possible relationship between cathodal isoperoxidase bands and subgeneric classification lies in our finding of a single band ca. 24 mm below the origin in *C. alternifolia* L. (subgen. *Mesomora* Raf.) and two bands at ca. 20 mm and 12 mm below the origin in *C. officinalis* Sieb. & Zucc. (Subgen. *Cornus*).

In summary, the taxon being grown and distributed as *Cornus kousa* var. *angustata* in the American nursery trade is biologically and chemically distinct from both *C. kousa* and *C. capitata*, and following the consensus that the segregate genera should not be considered (Eyde 1987), *C. kousa* var. *angustata* should be recognized at the specific level in the genus *Cornus*.

Cornus angustata (Chun) T.R. Dudley, *comb. nov.* BASIONYM: *Cornus kousa* F. Buerger *ex* Hance var. *angustata* Chun, Sunyatsenia 1:285. 1934. *Benthamidia japonica* (Sieb. & Zucc.) Hara var. *angustata* (Chun) Hara, J. Arnold Arb. 29:114. 1948; *Dendrobenthamia angustata* (Chun) Fang, Acta Phytotax. Sin. 2:95. 1953; *Cornus capitata* Wall. *ex* Roxb. subsp. *angustata* (Chun) Q.Y. Xiang, Bull. Bot. Res., Harbin 7:40. 1987.

NOTE: All of the chemical analyses reported in this paper had been completed by April, 1992 and the preparation of a manuscript such as this had been alluded to by Santamour & Dudley (1992). However, medical problems encountered by T.R. Dudley delayed

the finalization of the work until August 1994. Dr. Dudley passed away on 17 December 1994.

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